UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/052,538	01/23/2002	Tetsunori Kaji	520.35237VX3	4015

20457 7590 12/28/2005

ANTONELLI, TERRY, STOUT & KRAUS, LLP
1300 NORTH SEVENTEENTH STREET
SUITE 1800
ARLINGTON, VA 22209-3873

EXAMINER	
CROWELL, ANNA M	
ART UNIT	PAPER NUMBER
1763	

DATE MAILED: 12/28/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/052,538	KAJI ET AL.	
	Examiner	Art Unit	
	Michelle Crowell	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 September 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *42,43,46,47,50,51,53 and 55-78* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *42,43,46,47,50,51,53 and 55-78* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Status of claims

Claims 42, 43, 46, 47, 50, 51, 53, and 55-78 are pending in the application. Claims 42, 43, 46, 47, 50, 51, 53, and 55-78 are rejected.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on September 30, 2005 has been entered.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 75-78 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

3. Claim 75 requires a "a magnetic field designed to generate increased plasma at the portion within an outer periphery of the sample which is greater than the plasma at the center of the sample, the magnetic field forming means producing an intensity of the magnetic field on the sample smaller than 30 gauss". The specification fails to disclose this feature. On page 30, the specification indicates that the intensity ranges between **10 gauss to 110 gauss**, not less than 30 gauss.

4. Claims 51, 57, 66, and 75 require "to etch a fine pattern of 0.2 μm or smaller on the sample". The specification portion of the current invention fails to disclose this feature. The prior art (col. 3, lines 33-37, USP 6,197,151) indicates that it is difficult to manufacture a fine pattern of 0.2 μm or smaller on the sample. The current invention simply requires "to manufacture a **fine pattern** (no dimensions are given for the fine pattern) on a large sized sample having a diameter of 300 mm or more (col. 5, lines 7-10), not specifically a fine pattern of 0.2 μm or smaller on the sample.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various

claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 42, 50, 51, 55- 57, 59-61, 65-66, 68-70, and 74 are rejected under 35 U.S.C. 103(a) as being unpatentable over Collins et al. (U.S. 5,300,460) in view of Ohmi (U.S. 5,272,417) and Lenz et al. (U.S. 5,609,720).

Referring to column 8, line 28-column 9, line 68, Collins et al. discloses a plasma processing apparatus comprising: a vacuum processing chamber (col. 7, lines 10-20), a pair of electrodes opposite to each other that are disposed in the vacuum processing chamber, one of the electrodes being used also as a sample table capable of holding a sample having a diameter of 127 mm containing an insulator (col. 7, lines 10-20, col. 8, line 44, col. 9, line 45), a gas introducing means capable of introducing a fluorine-containing etching gas into the vacuum processing chamber (col. 8, line 64, col. 9, line 15), a means for applying a high-frequency electric power of 50-600 MHz (col. 8, lines 28-34) between the pair of electrodes whose gap is set to 50-300 mm (col. 8, lines 35-43) and for setting a pressure inside the vacuum chamber to 0.267-26.66 Pa (col. 53-57) .

Collins et al. discloses a sample diameter of 127 mm; yet, fails to explicitly teach the diameter of the sample being 300 mm or more; however, it is still obvious.

Referring to column 2, lines 35-41, Lenz et al. teaches that it is conventionally known in the art to process a wafer having a diameter of 300 mm. Thus, it would have been obvious to

scale up the apparatus of Ohmi to process a wafer having a diameter of 300 mm since it is conventionally known in the art to process wafers having a diameter of 300 mm. Additionally, according to In Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984), the Federal Circuit held that, where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to scale up/down the apparatus of Ohmi in order to process a sample with a diameter of 300 mm or more.

Collins et al. fails to disclose a bias electric power source.

Referring to Figure 1 and column 6, lines 62-68, Ohmi teaches a bias electric power source 110 connected to sample table 104 for generating a bias voltage. It is conventionally known in the art bias the sample table since this would change the energy of the ions reaching the sample surface in order to control the selectivity ratio. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the apparatus of Collins et al. with a bias electric power connected to the sample table since this would change the energy of the ions reaching the sample surface in order to control the selectivity ratio.

With respect to the plasma density, Collins et al. discloses a high frequency electric power source of 50-600 MHz, an electrode spacing of 50-300 mm, and a pressure of 0.267-26.66 Pa. It is known in the art to appropriately select the chamber conditions in order to generate high density plasma. Furthermore, it should be noted that plasma density is not a parameter that is set

or controlled directly. In fact, plasma density is set as a result of controlling process parameters such as pressure, power, and electrode spacing. Thus, since Collins et al. disclose a high frequency electric power source of 50-600 MHz, an electrode spacing of 50-300 mm, and a pressure of 0.267-26.66 Pa., it is inherent that the resulting plasma density generated in Collins in view of Ohmi et al. and Lenz et al. will fall between the range of $5x10^{10}$ cm^{-3} to $5x10^{11}$ cm^{-3}.

With respect to the "to etch a fine pattern of 0.2 μm or smaller on the sample having a diameter of 300 mm or more", this limitation is considered a process limitation. The apparatus of Collins in view of Ohmi et al. and Lenz et al. is capable of being used to produce such a fine pattern of 0.2 μm or smaller on the sample having a diameter of 300 mm or more by simply optimizing the power, pressure, and electrode spacing. Furthermore, apparatus claims cover what a device is, not what a device does.

Regarding the limitation of "fluorine-containing etching gas", the type of gas used in apparatus claims is considered intended use and therefore is of no significance in determining patentability. Expressions relating the apparatus to contents thereof during an intended operation are of no significance in determining patentability of the apparatus claim. Ex parte Thibault, 164 USPQ 666, 667 (Bd. App. 1969). Furthermore, the apparatus of Ohmi is capable of providing a fluorine containing etching gas to the sample.

Regarding the limitation of "an insulator film in the sample", this is considered intended use and therefore is of no significance in determining patentability. The inclusion of material or article worked upon by a structure being claimed does not impart patentability to the claims." In

re Young, 75 F.2d 966, 25 USPQ 69 (CCPA 1935) (as restated in In re Otto, 312 F.2d 937, 136 USPQ 458, 459 (CCPA 1963). Moreover, the apparatus of Collins et al. is capable of processing an insulator film in the sample.

With respect to claims 42, 61, 70, Collins et al. fails to teach a decreasing means comprising an electrode cover comprising a material containing Si or C.

Referring to column 6, lines 33-43, Ohmi teaches a decreasing means comprising an electrode cover 101 comprising a material containing Si or C on the other of the pair of plate electrodes to react with fluorine. The electrode cover 101 prevents etching of the electrode 102. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide one of the electrodes of Collins et al. with the decreasing means comprising an electrode cover as taught by Ohmi in order to prevent etching of the electrode.

With respect to claims 55, 59, 68, Collins et al. discloses a gap set at 50-300 mm, thus the apparatus of Collins et al. in view of Ohmi and Lenz et al. is capable of utilizing surface reaction between the pair of electrodes effectively to decrease the amount of fluorine in the plasma near the sample.

Regarding the above apparatus claims, it should be noted that a claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

8. Claims 43, 62, and 71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Collins et al. (U.S. 5,300,460) in view of Ohmi (U.S. 5,272,417) and Lenz et al. (U.S. 5,609,720) as applied to claims 42, 50-51, 55- 57, 59-61, 65-66, 68-70, and 74 above, and further in view of Sakamoto et al. (U.S. 5,698,062).

The teachings of Collins et al. in view of Ohmi in view of Lenz et al. have been discussed above.

Collins et al. in view of Ohmi in view of Lenz et al. fails to teach a gas diffusion plate.

Referring to column 5, lines 21-35, Sakamoto et al. teaches a plasma processing apparatus wherein the gas introducing means 26, 21 has a gas diffusion plate 24. It is well known in the art for the upper electrode to include a gas introducing means having a gas diffusion plate in order to uniformly distribute process gases. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the upper electrode of Collins et al. in view of Ohmi and Lenz et al. with a gas introducing means having a gas diffusion plate as taught by Sakamoto et al. in order to uniformly distribute process gases.

9. Claims 46, 47, 63, 64, 72, and 73 are rejected under 35 U.S.C. 103(a) as being unpatentable over Collins et al. (U.S. 5,300,460) in view of Ohmi (U.S. 5,272,417) and Lenz et al. (U.S. 5,609,720) as applied to claims 42, 50-51, 55- 57, 59-61, 65-66, 68-70, and 74 above, and further in view of Ishii (U.S. 5,529,657).

The teachings of Collins et al. in view of Ohmi in view of Lenz et al. have been discussed above.

Collins et al. in view of Ohmi in view of Lenz et al. fails to teach a susceptor cover.

Referring to Figures 3-6 and column 4, line 49 – column 5, line 12, Ishii teaches a plasma processing apparatus comprising a susceptive cover 6 comprised of carbon or silicon located adjacent to one of the pair of electrodes 31 (col. 4, lines 50-54, col. 5, lines 9-12). The susceptor cover 6 has a thickness of 2 mm (col. 4, lines 63-65). The susceptor cover directs the plasma to the surface of the wafer. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide one of the pair of electrodes of Collins et al. in view of Ohmi and Lenz et al. with the susceptor cover as taught by Ishii in order to direct the plasma to the surface of the wafer.

10. Claims 53, 58, and 67 are rejected under 35 U.S.C. 103(a) as being unpatentable over Collins et al. (U.S. 5,300,460) in view of Ohmi (U.S. 5,272,417) and Lenz et al. (U.S. 5,609,720) as applied to claims 42, 50-51, 55- 57, 59-61, 65-66, 68-70, and 74 above, and further in view of Sakamoto et al. (U.S. 5,698,062).

The teachings Collins et al. in view of Ohmi and Lenz et al. have been discussed above.

Collins et al. in view of Ohmi and Lenz et al. fails to teach one of the electrodes having an electrostatic attracting film with a heat transfer gas being supplied between the film and the sample surface.

Referring to Figure 1 and column 5, lines 3-13, Sakamoto et al. teaches a plasma processing apparatus wherein one of the electrodes has an electrostatic attracting film 11 with a heat transfer gas 14 being supplied between the film and the sample surface W in order to secure the sample to the electrode during processing. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide one of the electrodes of Collins et

al. in view of Ohmi and Lenz et al. with an electrostatic attracting film with a heat transfer gas being supplied between the film and the sample surface as taught by Sakamoto et al. in order to effectively secure the sample to the electrode during processing.

11. Claims 75-78 are rejected under 35 U.S.C. 103(a) as being unpatentable over Collins et al. (U.S. 5,300,460) in view of Ohmi (U.S. 5,272,417) and Lenz et al. (U.S. 5,609,720) as applied to claims 42, 50-51, 55- 57, 59-61, 65-66, 68-70, and 74 above, and further in view of Mintz et al. (U.S. 5,223,457).

The teachings Collins et al. in view of Ohmi and Lenz et al. have been discussed above.

Collins et al. in view of Ohmi and Lenz et al. fails to teach the magnetic field smaller than 30 gauss.

It should be noted that Ohmi teaches a magnetic field forming means 106 (Fig. 1a, col. 11, lines 26-34).

Referring to column 6, lines 51-59, Mintz teaches a plasma etching apparatus using a magnetic field less than 30 gauss (between 1-20 gauss) in order to deflect plasma ions and thereby prevent wafer contamination. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention for the magnetic field forming means of Collins et al. in view of Ohmi and Lenz et al. with a magnetic field intensity less than 30 gauss as taught by Mintz et al. in order to deflect plasma ions and thereby prevent wafer contamination.

Collins et al. in view of Ohmi and Lenz et al. fails to teach that the magnetic field forming means includes a pair of coils.

Referring to column 6, lines 51-59, Mintz teaches a plasma etching apparatus using a coils as the magnetic field forming means. It is conventionally known in the art to alternatively use coils instead of a magnet in order to generate a magnetic field. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the magnetic field forming means of Collins et al. in view of Ohmi and Lenz et al. with coils since this is an alternate and equivalent structure to generate a magnetic field.

Second Art Rejection

12. Claims 42, 50-51, 55- 57, 59-61, 65-66, 68-70, and 74 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohmi (U.S. 5,272,417) in view of Collins et al. and Lenz et al. (U.S. 5,609,720).

Referring to Figure 1, column 6, line 25-column 7, line 6, and column 8, line 61-68, Ohmi discloses a plasma processing apparatus comprising: a vacuum processing chamber 105 (col. 6, lines 27-28), a pair of electrodes 102, 104 opposite to each other that are disposed in the vacuum processing chamber, one of the electrodes 104 being used also as a sample table capable of holding a sample having a diameter of 254 mm containing an insulator film (col. 6, lines 25-27, col. 12, lines 12-15, col. 15, lines 64-68), a gas introducing means capable of introducing a fluorine-containing etching gas into the vacuum processing chamber (col. 6, lines 30-31, col. 8, lines 65-66), means for applying a high frequency electric power of 100 MHz –250 MHz is applied between the pair of electrodes (col. 8, lines 23-27, col. 4, lines 31-33) whose gap is set to 30 mm (col. 8, line 24) and for setting a pressure inside the vacuum processing chamber to 0.933

Pa (col. 8, line 25), bias electric power source 110 connected to the one electrode 104 (col. 6, lines 62-68).

Ohmi fails to specifically teach a motivation for the processing parameters and a pressure range of 1.0 to 4.0 Pa.

Referring to column 8, lines 28-57, Collins et al. additionally teaches a means for applying a high-frequency electric power of 50-600 MHz (col. 8, lines 28-34) between the pair of electrodes whose gap is set to 50-300 mm (col. 8, lines 35-43) and for setting a pressure inside the vacuum chamber to 0.267-26.66 Pa (col. 53-57) so that anisotropic etch will occur at the desired etch rate. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to operate the apparatus of Ohmi with the process parameters and specifically the pressure range of Collins et al. so that anisotropic etch will occur at the desired etch rate.

Ohmi discloses a sample diameter of 254 mm; yet, fails to explicitly teach the diameter of the sample being 300 mm or more; however, it is still obvious.

Referring to column 2, lines 35-41, Lenz et al. teaches that it is conventionally known in the art to process a wafer having a diameter of 300 mm. Thus, it would have been obvious to scale up the apparatus of Ohmi to process a wafer having a diameter of 300 mm since it is conventionally known in the art to process wafers having a diameter of 300 mm. Additionally, according to In Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984), the Federal Circuit held that, where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior

art device. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to scale up/down the apparatus of Ohmi in order to process a sample with a diameter of 300 mm or more.

With respect to the plasma density, Ohmi et al. and Collins et al. discloses a high frequency electric power source of 10-250 MHz, an electrode spacing of 30 mm, and a pressure of 0.267-26.66 Pa. It is inherently known in the art the high density plasma is generated from the appropriate chamber conditions. Furthermore, it should be noted that plasma density is not a parameter that is set or controlled directly. In fact, plasma density is set as a result of controlling process parameters such as pressure, power, and electrode spacing. Thus, since Ohmi et al. and Collins et al. disclose a high frequency electric power source of 10-250 MHz, an electrode spacing of 30 mm, and a pressure of 0.267-26.66 Pa, it is inherent that the resulting plasma density generated in Ohmi in view of Collins et al. and Lenz et al. will fall between the range of $5x10^{10}$ cm^{-3} to $5x10^{11}$ cm^{-3}.

With respect to the "to etch a fine pattern of 0.2 μm or smaller on the sample having a diameter of 300 mm or more", this limitation is considered a process limitation. The apparatus of Collins in view of Ohmi et al. and Lenz et al. is capable of being used to produce such a fine pattern of 0.2 μm or smaller on the sample having a diameter of 300 mm or more by simply optimizing the power, pressure, and electrode spacing. Furthermore, apparatus claims cover what a device is, not what a device does.

Regarding the limitation of "fluorine-containing etching gas", the type of gas used in apparatus claims is considered intended use and therefore is of no significance in determining

patentability. Expressions relating the apparatus to contents thereof during an intended operation are of no significance in determining patentability of the apparatus claim. Ex parte Thibault, 164 USPQ 666, 667 (Bd. App. 1969). Furthermore, the apparatus of Ohmi is capable of providing a fluorine containing etching gas to the sample.

Regarding the limitation of "a pressure condition of 0.5 Pa to 4.0 Pa", this is considered intended use and therefore is of no significance in determining patentability. The apparatus of Ohmi is capable of providing a pressure condition of 0.5 Pa to 4.0 Pa.

Regarding the limitation of "an insulator film in the sample", this is considered intended use and therefore is of no significance in determining patentability. The inclusion of material or article worked upon by a structure being claimed does not impart patentability to the claims." In re Young, 75 F.2d 966, 25 USPQ 69 (CCPA 1935) (as restated in In re Otto, 312 F.2d 937, 136 USPQ 458, 459 (CCPA 1963). Moreover, the apparatus of Ohmi is capable of processing an insulator film in the sample.

With respect to claims 42, 61, 70, Ohmi discloses a means for decreasing the amount of fluorine in the plasma to decrease the amount of fluorine near the sample, the decreasing means comprising an electrode cover 101 comprising a material containing Si or C on the other of the pair of plate electrodes (col. 6, lines 33-43) to react with fluorine and setting a gap between the plate electrodes is set to 30 mm (col. 8, line 24).

With respect to claims 50 65, 74, Ohmi discloses a plasma processing apparatus further including a bias electric power source 110 connected to the one electrode 104 used as a sample table for applying a bias voltage to the sample (col. 6, lines 62-68).

With respect to claims 55, 59, 68, Ohmi discloses a gap set at 30 mm, thus the apparatus of Ohmi is capable of utilizing surface reaction between the pair of electrodes effectively to decrease the amount of fluorine in the plasma near the sample.

Regarding the above apparatus claims, it should be noted that a claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

13. Claims 43, 62, and 71 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ohmi (U.S. 5,272,417) in view of Collins et al. and Lenz et al. (U.S. 5,609,720) as applied to claims 42, 50-51, 55- 57, 59-61, 65-66, 68-70, and 74 above, and further in view of Sakamoto et al. (U.S. 5,698,062).

The teachings of Ohmi in view of Collins et al. and Lenz et al. have been discussed above.

Ohmi in view of Collins et al. and Lenz et al. fails to teach a gas diffusion plate.

Referring to column 5, lines 21-35, Sakamoto et al. teaches a plasma processing apparatus wherein the gas introducing means 26, 21 has a gas diffusion plate 24. It is well known in the art for the upper electrode to include a gas introducing means having a gas diffusion plate in order to uniformly distribute process gases. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the upper electrode of

Ohmi in view of Collins et al. and Lenz et al. with a gas introducing means having a gas diffusion plate as taught by Sakamoto et al. in order to uniformly distribute process gases.

14. Claims 46, 47, 63, 64, 72, and 73 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohmi (U.S. 5,272,417) in view of Collins et al. and Lenz et al. (U.S. 5,609,720) as applied to claims 42, 50-51, 55- 57, 59-61, 65-66, 68-70, and 74 above, and further in view of Ishii (U.S. 5,529,657).

The teachings of Ohmi in view of Collins et al. and Lenz et al. have been discussed above.

Ohmi in view of Collins et al. and Lenz et al. fails to teach a susceptor cover.

Referring to Figures 3-6 and column 4, line 49 – column 5, line 12, Ishii teaches a plasma processing apparatus comprising a susceptive cover 6 comprised of carbon or silicon located adjacent to one of the pair of electrodes 31 (col. 4, lines 50-54, col. 5, lines 9-12). The susceptor cover 6 has a thickness of 2 mm (col. 4, lines 63-65). The susceptor cover directs the plasma to the surface of the wafer. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide one of the pair of electrodes of Ohmi in view of Lenz et al. with the susceptor cover as taught by Ishii in order to direct the plasma to the surface of the wafer.

15. Claims 53, 58, and 67 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ohmi (U.S. 5,272,417) in view of Collins et al. and Lenz et al. (U.S. 5,609,720) as applied to

claims 42, 50-51, 55- 57, 59-61, 65-66, 68-70, and 74 above, and further in view of Sakamoto et al. (U.S. 5,698,062).

The teachings of Ohmi in view of Collins et al. and Lenz et al. have been discussed above.

Ohmi in view of Collins et al. and Lenz et al. fails to teach one of the electrodes having an electrostatic attracting film with a heat transfer gas being supplied between the film and the sample surface.

Referring to Figure 1 and column 5, lines 3-13, Sakamoto et al. teaches a plasma processing apparatus wherein one of the electrodes has an electrostatic attracting film 11 with a heat transfer gas 14 being supplied between the film and the sample surface W in order to secure the sample to the electrode during processing. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide one of the electrodes of Ohmi in view of Collins et al. and Lenz et al. with an electrostatic attracting film with a heat transfer gas being supplied between the film and the sample surface as taught by Sakamoto et al. in order to effectively secure the sample to the electrode during processing.

16. Claims 75-78 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohmi (U.S. 5,272,417) in view of Collins et al. (U.S. 5,300,460) and Lenz et al. (U.S. 5,609,720) as applied to claims 42, 50-51, 55- 57, 59-61, 65-66, 68-70, and 74 above, and further in view of Mintz et al. (U.S. 5,223,457).

The teachings Ohmi in view of Collins et al. and Lenz et al. have been discussed above.

Ohmi in view of Collins et al. and Lenz et al. fails to teach the magnetic field smaller than 30 gauss.

It should be noted that Ohmi teaches a magnetic field forming means 106 (Fig. 1a, col. 11, lines 26-34).

Referring to column 6, lines 51-59, Mintz et al. teaches a plasma etching apparatus using a magnetic field less than 30 gauss (between 1-20 gauss) in order to deflect plasma ions and thereby prevent wafer contamination. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the magnetic field forming means of Ohmi in view of Collins et al. and Lenz et al. with the magnetic field forming means having a magnetic field intensity less than 30 gauss as taught by Mintz et al. in order to deflect plasma ions and thereby prevent wafer contamination.

Ohmi in view of Collins et al. and Lenz et al. fails to teach that the magnetic field forming means includes a pair of coils.

Referring to column 6, lines 51-59, Mintz teaches a plasma etching apparatus using a coils as the magnetic field forming means. It is conventionally known in the art to alternatively use coils instead of a magnet in order to generate a magnetic field. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the magnetic field forming means of Ohmi in view of Collins et al. and Lenz et al. with coils since this is an alternate and equivalent structure to generate a magnetic field.

Third Art Rejection

17. Claims 57-60 and 66-69 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koshiishi et al. (U.S. 5,919,332) in view of Lenz et al. (U.S. 5,609,720).

Referring to Figure 1 and column 9, line 7-column 13, line 17, Koshiishi et al. discloses a plasma etching apparatus comprising a vacuum processing chamber 2 (Fig. 1) and a pair of electrodes 6, 21 opposite to each other that are disposed in the vacuum processing chamber (col.9, lines 66-67), one of the electrodes being used also as a sample table 6 capable of holding a sample containing an insulator film (col. 11, line 40), wherein the plasma etching apparatus further comprises: a gas introducing means 23, 27 for introducing an etching gas containing at least fluorine and carbon into the vacuum processing chamber (col. 10, lines 17-24), means for generating a plasma with a density of 5×10^{10} cm^{-3} to 5×10^{11} cm^{-3} between the pair of electrodes to provide a substantially uniform plasma over the sample or more to etch a fine pattern on the sample (col. 13, lines 14-17); and a bias electric power source 44 connected to one of the electrodes to control energy of ions in the plasma (col. 11, lines 17-23).

Koshiishi et al. fail to specifically teach the sample having a diameter of 300 mm.

Referring to column 2, lines 35-41, Lenz et al. teaches that it is conventionally known in the art to process a wafer having a diameter of 300 mm. Thus, it would have been obvious to scale up the apparatus including the table of Koshiishi et al. to process a wafer having a diameter of 300 mm since it is conventionally known in the art to process wafers having a diameter of 300 mm. Additionally, according to In Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984), the Federal Circuit held that, where the only difference between the prior art and the claims was a recitation of relative

dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to scale up/down the apparatus including the table of Koshiishi et al. in order to process a sample with a diameter of 300 mm or more and additionally the motivation for optimizing the size of the table is to enable the table to hold the desired size of substrate.

With respect to the "to etch a fine pattern of 0.2 μm or smaller on the sample having a diameter of 300 mm or more", this limitation is considered a process limitation. The apparatus of Koshiishi et al. in view of Lenz et al. discloses a plasma density of 5×10^{10} cm^{-3} to 5×10^{11} cm^{-3} and thus the apparatus is capable of being used to produce such a fine pattern of 0.2 μm or smaller on the sample having a diameter of 300 mm or more by simply optimizing the power, pressure, and electrode spacing. Furthermore, apparatus claims cover what a device is, not what a device does.

With respect to claims 58, 67, the plasma etching apparatus of Koshiishi et al. in view of Lenz et al. further includes that one of the electrodes is provided with an electrostatic attracting film 11, heat transfer gas being supplied between the electrostatic attracting film and a back surface of the sample (col. 9, lines 38-53).

With respect to claims 59, 68, the plasma etching apparatus of Koshiishi et al. in view of Lenz et al. further includes the gap is set to a distance capable of utilizing surface reaction between the pair of electrodes effectively to decrease the amount of fluorine in the plasma near the sample (col. 10, line 15, col. 14, lines 4-6).

With respect to claims 60, 69, the plasma etching apparatus of Koshiishi et al. in view of Lenz et al. further includes means for setting the atmospheric pressure sets it to 1.0 Pa to 4.0 Pa (10 mTorr, col. 11, lines 62-63).

18. Claims 61-65 and 70-74 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koshiishi et al. (U.S. 5,919,332) in view of Lenz et al. (U.S. 5,609,720) as applied to claims 57-60 and 66-69 above, and further in view of Ohmi (U.S. 5,272,417).

Referring to column 6, lines 33-43, Ohmi teaches a decreasing means comprising an electrode cover 101 comprising a material containing Si or C on the other of the pair of plate electrodes to react with fluorine. The electrode cover 101 prevents etching of the electrode 102. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide one of the electrodes of Koshiishi et al. in view of Lenz et al. with the decreasing means comprising an electrode cover as taught by Ohmi in order to prevent etching of the electrode.

With respect to claims 62, 71, the plasma etching apparatus of Koshiishi et al. in view of Lenz et al. further includes the gas introducing means has a gas diffusion plate 21, 22 (col. 10, lines 17-24).

With respect to claims 63, 64, 72, 73, the plasma etching apparatus of Koshiishi et al. in view of Lenz et al. further includes discharge confining ring 31 and/or a susceptor cover 13 containing Si or C is situated near the sample (col. 9, lines 54-65, col. 10, lines 25-46).

With respect to claims 65, 74, the plasma etching apparatus of Koshiishi et al. in view of Lenz et al. further includes comprising a bias electric power source 44 connected to the one

electrode used as a sample table for applying a bias voltage to the sample table (col. 11, lines 17-23).

19. Claims 51, 53, 55, and 56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koshiishi et al. (U.S. 5,919,332) in view of Lenz et al. (U.S. 5,609,720) as applied to claims 57-60 and 66-69 above, and further in view of Collins et al. (U.S. 5,300,460).

The teachings of Koshiishi et al. in view of Lenz et al. have been discussed above.

Koshiishi et al. in view of Lenz et al. fail to explicitly teach a power of 30 MHz to 300 MHz; however, the combination (specifically Koshiishi et al., col. 11, lines 23-29) teaches that the apparatus is capable of operating a power source 47 at a frequency higher than 1 MHz.

Additionally, referring to column 7, lines 37-54, Collins teaches that it is conventionally known in the art to use a power source in a frequency range of 30 MHz to 300 MHz since it enhances the etch rate and reduces microloading effects. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention for the frequency range of the power source of Koshiishi et al. in view of Lenz et al. to operate between 30 MHz to 300 MHz as taught by Collins et al. since it enhances the etch rate and reduces microloading effects.

20. Claims 42, 43, 46, 47, 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koshiishi et al. (U.S. 5,919,332) in view of Lenz et al. (U.S. 5,609,720) and Collins et al. (U.S. 5,300,460) as applied to claims 51, 53, 55, and 56 above, and further in view of Ohmi (U.S. 5,272,417).

The teachings of Koshiishi et al. in view of Lenz et al. and Collins et al. have been discussed above.

Koshiishi et al. in view of Lenz et al. and Collins et al. fail to teach a decreasing means comprising an electrode cover.

Referring to column 6, lines 33-43, Ohmi teaches a decreasing means comprising an electrode cover 101 comprising a material containing Si or C on the other of the pair of plate electrodes to react with fluorine. The electrode cover 101 prevents etching of the electrode 102. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide one of the electrodes of Koshiishi et al. in view of Lenz et al. and Collins et al. with the decreasing means comprising an electrode cover as taught by Ohmi in order to prevent etching of the electrode.

With respect to claim 43, the plasma etching apparatus of Koshiishi et al. in view of Lenz et al. further includes the gas introducing means has a gas diffusion plate 21, 22 (col. 10, lines 17-24).

With respect to claims 46, 47, the plasma etching apparatus of Koshiishi et al. in view of Lenz et al. further includes discharge confining ring 31 and/or a susceptor cover 13 containing Si or C is situated near the sample (col. 9, lines 54-65, col. 10, lines 25-46).

With respect to claims 50, the plasma etching apparatus of Koshiishi et al. in view of Lenz et al. further includes comprising a bias electric power source 44 connected to the one electrode used as a sample table for applying a bias voltage to the sample table (col. 11, lines 17-23).

21. Claims 75-78 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koshiishi et al. (U.S. 5,919,332) in view of Lenz et al. (U.S. 5,609,720) and Collins et al. (U.S. 5,300,460) as applied to claims 51, 53, 55, and 56 above, and further in view of Mintz et al. (U.S. 5,223,457).

The teachings of Koshiishi et al. in view of Lenz et al. and Collins et al. have been discussed above.

Koshiishi et al. in view of Lenz et al. and Collins et al. fail to teach a magnetic field forming means having a magnetic field smaller than 30 gauss.

Referring to column 6, lines 51-59, Mintz et al. teaches a plasma etching apparatus using teach a magnetic field forming means 114, 115 having magnetic field less than 30 gauss (between 1-20 gauss) in order to deflect plasma ions and thereby prevent wafer contamination. The magnetic field forming means 114, 115 further comprises coils. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention for the magnetic field forming means of Ohmi in view of Collins et al. and Lenz et al. with a magnetic field intensity less than 30 gauss as taught by Mintz et al. in order to deflect plasma ions and thereby prevent wafer contamination.

Response to Arguments

22. Applicant's arguments filed September 30, 2005 have been fully considered but they are not persuasive.

Applicant has argued the following:

(1) Neither Collins nor Ohmi teach or suggest the critical range of plasma density of 5 x 10^{10} cm^{-3} to 5 x 10^{11} cm^{-3} for the processing; however as stated above, Ohmi et al. and Collins et al. disclose apparati capable of using a high frequency electric power source operating in a

frequency range between 30-300 MHz, an electrode spacing of in a range between 30 mm-60mm, and a pressure range between of 0.4-4.0 Pa. It is inherently known in the art the high density plasma is generated from the appropriate chamber conditions. **Furthermore, it should be noted that plasma density is not a parameter that is set or controlled directly. In fact, plasma density is set as a result of controlling process parameters such as pressure, power, and electrode spacing.** Thus, since Ohmi et al. and Collins et al. disclose apparati capable of using a high frequency electric power source operating in a frequency range between 30-300 MHz, an electrode spacing of in a range between 30 mm-60mm, and a pressure range between of 0.4-4.0 Pa., it is inherent that the resulting plasma density generated in Ohmi in view of Collins et al. and Lenz et al. will fall between the range of $5x10^{10}$ cm^{-3} to $5x10^{11}$ cm^{-3}. Additionally, Koshiishi et al. discloses the claimed plasma density of 5×10^{10} cm^{-3} to 5×10^{11} cm^{-3}.

(2) neither Collins nor Ohmi deal with samples having a diameter of 300 mm or larger, however, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). In the instant application, Lenz et al. teaches processing a sample having a diameter of 300 mm or larger. The motivation to optimize the size of the table of Collins or Ohmi is to enable the table to hold the desired size of substrate. Additionally, according to In Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984), the Federal Circuit held that, where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the

claimed device was not patentably distinct from the prior art device. Thus, the combination of Collins in view of Lenz et al. or Ohmi in view of Lenz et al. satisfies the claimed requirement.

(3) neither Collins nor Ohmi teach or suggest the etching of a fine pattern of 0.2 pm or smaller on the sample; however as stated above, this limitation is considered a process limitation. The apparatus of Collins in view of Ohmi et al. and Lenz et al. is capable of being used to produce such a fine pattern of 0.2 μm or smaller on the sample having a diameter of 300 mm or more by simply optimizing the power, pressure, and electrode spacing. Moreover, the etching pattern of 0.2 pm or smaller on the sample is a direct result of controlling the process parameters such as the high frequency electric power source in a frequency range between 30-300 MHz, the electrode spacing in a range between 30 mm-60mm, and the pressure range between of 0.4-4.0 Pa which the apparati of Collins and Ohmi are capable of doing. Furthermore, apparatus claims cover what a device is, not what a device does.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michelle Crowell whose telephone number is (571) 272-1432. The examiner can normally be reached on M-F (9:30 -6:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571) 272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Michelle Crowell
Patent Examiner
Art Unit 1763
12-22-05

Parviz Hassanzadeh
Supervisory Patent Examiner
Art Unit 1763